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e-brief

Estimating the Effect of the Canadian Government's 2006-2007 Greenhouse Gas Policies

By Mark Jaccard and Nic Rivers*

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Mounting public concern about climate change has prompted the Canadian government to respond with a major policy effort to reduce greenhouse gas (GHG) emissions. Since early 2006, the Conservative government has launched a series of initiatives under its "ecoACTION" banner, culminating in the release in April 2007 of its "regulatory framework for air emissions," which is currently under consultative review.

The government maintains that the combined effect of its policies will reduce Canadian GHG emissions to a target 20 percent below today's levels by 2020.[1] The government also says that this initiative moves Canada toward its emission target for 2050 — a 65 percent reduction from current levels. If achieved, this four-decade target represents a profound transformation of our energy-economy system.

While these initiatives and commitments are undoubtedly taken in earnest, Canadian governments have an unfortunate record on GHG targets and policies. Since 1988, Canadian governments have, on several occasions, set targets for reduced GHG emissions and implemented policy initiatives to achieve those targets. However, five major policy initiatives have failed to stem the steady growth of Canadian GHG emissions, as shown in Figure 1. Emissions actually rose faster during the period of policy initiatives, from 1990 to 2006, than during the previous decade, from 1980 to 1990, even though this earlier period had no GHG reduction policies.

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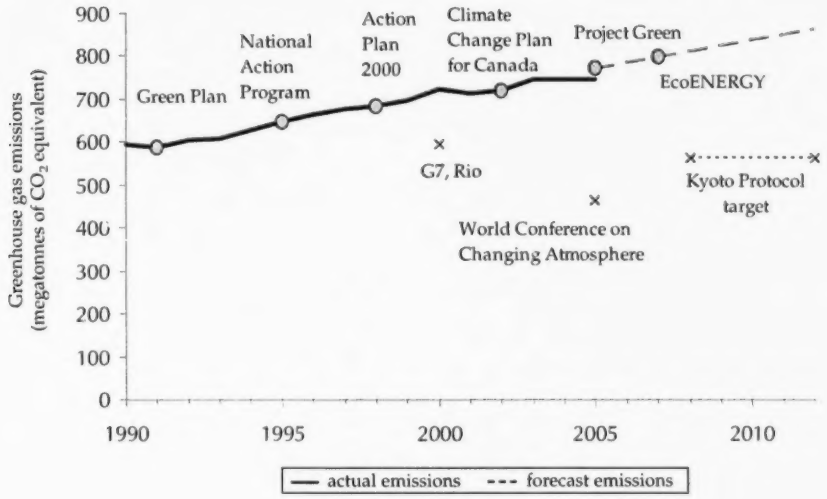
1 Emissions in 2020 would be about 150 megatonnes (Mt) below current levels (750 Mt) and a full 300 Mt below the levels they were projected to reach by 2020 in the absence of new reduction policies.

Figure 1: *Canada's GHG Targets, Policies and Emissions 1990–2007*



Source: Authors' calculations.

To estimate the effects of the current slate of federal greenhouse gas policies, we apply an energy-economy simulation model and other analytical tools at our research group at Simon Fraser University.[2] This e-brief is an executive summary of a larger Working Paper on our findings, available on the C.D. Howe Institute website.

Our analysis depends in part on the CIMS energy-economy policy simulation model, which is typical of the leading models used by governments and researchers for this type of analysis.[3] CIMS is an integrated energy supply, energy demand and macro-economy model, meaning that it simultaneously simulates the effect of all policies intended to reduce GHG emissions — thereby ensuring that the effects of overlapping policies are not double-counted. The model is technologically explicit, in that it keeps track of energy producing and using technologies. And its firm and household behavioural parameters are estimated using standard statistical methods from past market data and, in some cases, from surveys of consumer receptivity to new and emerging technologies — thereby reducing the risk of biased assumptions about the responsiveness of consumers and businesses to GHG policies. The value of this approach is well

2 The Energy and Materials Research Group in the School of Resource and Environmental Management at Simon Fraser University has been simulating energy-economy policies for over two decades as independent research, but also under contract to government, industry, and non-government organizations in Canada and abroad.

3 In terms of its technological detail and portrayal of firm and household decision-making, CIMS has similarities with the NEMS model of the US government, the Maple-C model of Natural Resources Canada and the Energy 2020 model of Environment Canada.

recognized by applied researchers assisting governments in forecasting policy effectiveness.[4]

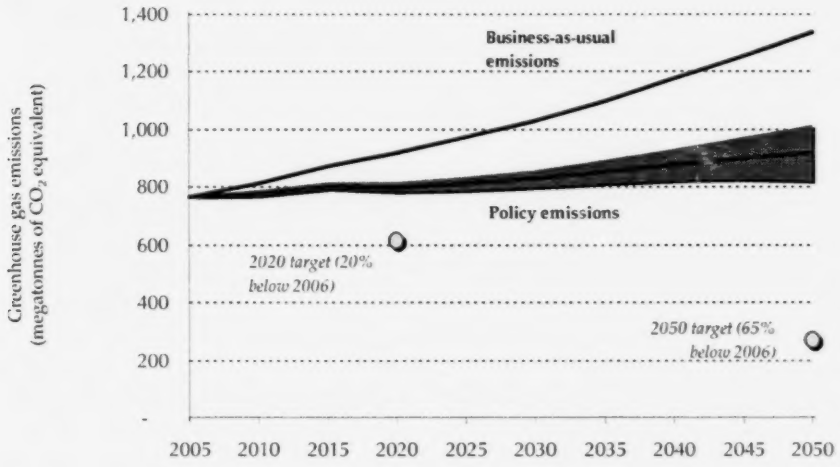
In this *e-brief*, we provide the results of our simulation of the government's GHG policies to the years 2020 and 2050. Since the government has not yet clarified all aspects of the policies over both of these timeframes, or resolved all of its long-run expectations for each policy, we made certain assumptions and asked Environment Canada for clarifications, which it provided where possible. Of particular importance, we assumed that the government would continue the 2 percent per year emission intensity reduction for large final emitters from 2015 all the way through to 2050, even though it has not announced this. We also assumed that the government would adopt the California vehicle GHG emissions regulations and continue to tighten these aggressively, even though it has not announced this. These two policy assumptions play the biggest role in the substantial emissions reductions in our simulation.

We tried to be true to the government's assumptions about policies. But for the response of firms and households to these policies, we relied on the empirically estimated behavioural parameters of the CIMS model and on policy effectiveness estimates from studies of similar policies in other jurisdictions — policies designed to stimulate greater energy efficiency, fuel switching, emissions control and land-use changes. Finally, an additional challenge was to sort out the net effect of policies that overlap. For example, the "offsets" allowed large industrial emitters could fund energy efficiency in residential dwellings, which might also occur because of provincial policies from the "climate change trust fund." Research shows that even with a very large bureaucracy scrutinizing all potentially relevant expenditures, it is impossible to prevent a certain amount of redundancy when policies allow for overlap such as this. In our background document on the C.D. Howe Institute website we explain our key assumptions and findings with regard to this challenge.

Our aggregate estimate of the effect of the Canadian government's 2006-2007 GHG policies on future emissions is presented in Figure 2. We estimate that these policies are likely to reduce emissions substantially compared to their business-as-usual evolution. By 2020, emissions would be 120 megatonnes below projected levels and by 2050 the reduction would be almost 400 megatonnes below the business-as-usual projection. However, the results also indicate that overall emissions in Canada are unlikely to fall below current levels. The government is likely to miss its 2020 emissions target by almost 200 megatonnes. Moreover, because of this gap in 2020 between target and reality, it is unlikely that a future government would be able to achieve the ambitious 2050 target.

4 See the recent special issue of *The Energy Journal*, the leading international energy economics journal: Hourcade, J-C., Jaccard, M., Bataille, C. and F. Ghersi, "Hybrid Modeling, New Answers to Old Challenges: Introduction to the Special Issue of the Energy Journal," *The Energy Journal*, Special Issue, 2006, 1-12. We note that the CIMS model was one of two models selected by a Canada-wide panel of experts and government representatives in Canada's National Climate Change Process, in 1998, to simulate policies for meeting Canada's 2010 Kyoto target. The model indicated that a GHG tax of $120–$150 per tonne of CO_2 needed to be implemented in 2000 if Canada was to meet its Kyoto target. The rising emissions of the past seven years suggest that a tax of this magnitude may indeed have been required. No tax or economy-wide emissions caps were implemented and emissions in 2006 were 31 percent above the target. For the explanation of the 1998 analysis and forecast, see Jaccard, M., Nyboer, J. and B. Sadownik, 2002, *The Cost of Climate Policy*, Vancouver: UBC Press.

Figure 2: *Estimated Effect of Canada's 2006-2007 GHG Policies*



Source: Authors' calculations.

Some of the uncertainty in our study is due to unresolved policy decisions by government. But significant uncertainty also results from the imperfect knowledge of energy-economy researchers about the responsiveness of businesses and households to policies that affect the information, costs and/or regulatory constraints of emitting GHGs. We accordingly adjusted key parameters to reflect this uncertainty and then executed multiple model runs. These are reflected in the grey band around our central forecast in the figure, showing that emissions in 2050 could range from 1,000 to 800 megatonnes.

As noted, our assumptions and analysis are detailed in another document. We summarize the salient points.

(i) Our assessment shows that the 2006-2007 policies of the current government of Canada will not be effective in meeting its stated targets. Leading independent research indicates that the principal reason for policy failure — in Canada especially, but elsewhere as well — is the unwillingness of government to place a value on the atmosphere. Setting a value on the atmosphere is essential since fossil fuels, the dominant source of human GHG emissions, will remain competitive with other energy sources for at least several decades and perhaps centuries. Such value-setting can only occur (1) directly via a GHG tax, the most economically efficient approach, or (2) indirectly by regulations that set a cap on emissions (perhaps with tradable permits), or control the carbon content of energy supplies, or control the emission characteristics of the technologies available in the market (vehicles, buildings, equipment). Policy reliance on information programs and subsidies to reduce GHGs may have a small

Table 1: *Estimated Emissions Reductions by Policy*

	Estimated Domestic GHG Reduction in 2020 Compared to BAU[a]	Estimated Domestic GHG Reduction in 2050 Compared to BAU
Phase I		
Public Transit Tax Credit	0.1 Mt	0.1 Mt
Renewable Fuel Standard	0.8 Mt	1.7 Mt
Phase II		
EcoENERGY Technology	1.1 Mt	8.0 Mt
EcoENERGY Efficiency	1.5 Mt	4.5 Mt
EcoENERGY Renewable	5.6 Mt	10.0 Mt
EcoTRANSPORT	1.2 Mt	2.2 Mt
EcoAGRICULTURE[b]	—	—
EcoTRUST	15.0 Mt	30.0 Mt
Phase III		
Large Industrial Emitters[c]	74.7 Mt	283.9 Mt
Passenger Vehicles	14.8 Mt	44.6 Mt
Energy-using Products	1.7 Mt	2.6 Mt
Total	**116.5 Mt**	**387.6 Mt**

Notes: [a] BAU stands for business-as-usual.

[b] No GHG reductions are assigned to EcoAGRICULTURE policies that encourage renewable fuel production. Reductions are accounted for under Renewable Fuel Standard.

[c] GHG reductions for Large Industrial Emitter policy include domestic offset credits.

Source: Authors' calculations.

effect, but cannot cause dramatic reductions in the short or long run.[5] Only with a cost to emitting GHGs (directly via tax or indirectly via regulation on emissions or technologies) will the economy see significant technological change over the next decades from the four major actions to reduce GHG emissions: greater energy efficiency, fuel switching to low or zero emission fuels, capture and storage of carbon, and changes in forestry and agricultural land use and management practices.

(ii) The government's 2006-2007 policies are an apparent improvement on previous policies in that the intensity reductions on industrial emissions are potentially greater (depending on the flexibility provisions) and there is an expectation of fully regulating vehicle GHG emissions. However, the regulation on industrial emissions allows industries to forego emissions reductions and instead pay subsidies to firms and households in the unregulated sectors of the economy. These subsidies will have a significantly weakened effect, as evidenced with past subsidy programs, because it is impossible to prevent free-riders — people receiving the subsidy for GHG reductions they would have undertaken anyway — and the subsidy budget can never be large enough to influence more than a small percentage of market activity.

5 A more detailed explanation and evidence is provided in Jaccard, M., Rivers, N., Bataille, C., Murphy, R., Nyboer, J., and B. Sadownik, *Burning Our Money to Warm the Planet: Canada's Ineffective Efforts to Reduce Greenhouse Gas Emissions*, Toronto: CD Howe Institute, 2006, 36 pages.

(iii) We estimated GHG emissions reductions by 2020 and 2050, based on the individual policies introduced by the government in 2006/2007. The total of 116.5 megatonnes of CO_2 equivalent in 2020 is far less than the 300 megatonne reduction required for the government to reach its 20 percent reduction target (Table 1).

(iv) This study is limited to assessing policy effectiveness and thus does not include an estimation of costs to the economy. In future analyses, we expect to assess the costs of the government's policies alongside alternative policies. The challenge for policymakers is to design policies that are effective at the lowest possible costs. Preliminary analysis suggests that the government's current policies — which will fail to meet its 2020 and 2050 targets — will incur costs to the GDP comparable to those of more effective policies that would actually achieve its targets. Costs imposed by an economy-wide GHG tax, or an economy-wide emissions cap, would not be substantially different.

This *e-brief* is a publication of the C.D. Howe Institute. **Mark Jaccard** is a professor and **Nic Rivers** a graduate student in the School of Resource and Environmental Management at Simon Fraser University. Professor Jaccard is also a Fellow-in-Residence at the C.D. Howe Institute.

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